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RECLAMATION OF FLOOD-DAMAGED LANDS IN THE KANSAS RIVER VALLEY BY FOREST PLANTING.

The flood of 1903 did great damage to much valuable land in the Kansas River Valley. The injured lands may be classed under the following four general heads:

(a) Sanded lands.

(b) Eroded lands.

(c) Eroded lands subsequently silted.

(d) Caving river banks.

Lands that were silted but not eroded are not classified as "injured," since it is believed that such lands were benefited rather than injured by the flood.

The following recommendations for the treatment of these lands are made with full knowledge of their former great value for agriculture, and with a keen realization of the extent of the damages wrought by the greatest calamity that ever visited this fertile valley.

SANDED LANDS.

At least 5,000 acres of fertile plowland were buried in coarse sand to such a depth as to be rendered worthless for agriculture for many years to come. This should receive the first attention, for the sands are likely to be shifted by the winds and deposited on land that is now fertile. In order to fix this sand, cottonwood trees should be planted over its entire surface this spring (1904). The flood of 1903 caused millions of cottonwoods to germinate on fields that were too wet for cultivation. From these natural nurseries may be obtained all the seedlings needed. If the planting is delayed until another year, the seedlings will be too large to plant, and the sand will have been blown into ridges, so that the ground will not be in as good condition for planting as it is now.

The cottonwood seedlings on farm lands should be gathered when the ground is plowed for a spring crop. It may be that a boy riding the front of the carriage of a sulky plow can catch and pull out from the loosened soil the best specimens before they are turned under. Otherwise they must be taken from beside or behind the plow. When an armful has been collected, the roots of the trees should be buried in the fresh soil for protection until they can be planted. The planting is a very simple operation. It may be advantageously performed by a man and a boy working together. The man, driving a spade into the sand, makes a slit, into which, behind the spade, the boy slips a tree; the man then withdraws the spade, tramping the soil about the tree as

he advances to plant the next one. The trees should be planted about 6 feet apart each way. This distance will require 1,210 trees per acre. The sanded land is already partially stocked in many places with trees from natural seeding, so that a considerable amount of the work of planting will be saved if this growth can be utilized. But to do this, planting must begin at once, because the irregular and scattered nature of the stand will cause such naturally-planted trees to be branchy if left in their present density, rendering the future growth almost worthless. Close planting will cause the young trees to form clean, straight boles.

After the plantation has grown six or eight years, it should be thinned by removing about half the stand. A second thinning at the end of twelve to fifteen years should remove about half of the remainder of the trees. At the end of twenty years the majority of the trees remaining may be cut out for sawlogs.

ERODED LANDS.

The eroded lands from which the fertile soil has been partially removed may be profitably planted to black walnut or hardy catalpa. If the plantation is to be made of catalpa alone, the work of planting should begin immediately. For this purpose one-year-old seedlings should be purchased from a nursery.

The trees should be planted from 4 by 8 to 4 by 6 feet apart. This rate of planting will require from 1,360 to 1,815 trees per acre. The catalpa after planting will need as good cultivation as is usually given to a corn crop. For the first two or three years the young trees must be kept free from weeds.

The catalpa may also be planted on sanded land, provided the sand is not over 2 feet in depth. This tree requires a rich soil, but its roots, which at maturity reach down to a depth of 4 or 5 feet, will quickly penetrate a foot or two of sand.

If the walnut is desirable it will probably be more profitable to plant it in mixture rather than in pure plantations. The walnut grows so slowly than the planter would have to wait too long for returns. If planted in mixture with such a rapid-growing species as the catalpa, the walnut seeds should be planted in the permanent sites two or three years prior to the introduction of the catalpa. This will give the walnut seedlings time to gain sufficient height to avoid being overtopped by the more rapidly growing catalpa. The catalpa makes its most rapid growth during the first ten years of its life, and matures early, while the walnut persists in its growth for a century or more. The Kansas River bottoms are exceedingly well adapted to the growth of walnut, and for a permanent forest growth there is no better species. Like the catalpa, it requires a fertile soil, and will probably give poor returns on lands covered with more than 2 feet of sand.

LANDS ERODED AND SUBSEQUENTLY SILTED.

Much land in the Kansas River Valley had the surface soil removed for several feet in depth, and was then covered with silt from a few inches to a foot deep. Where this land lies so low that it is likely to be submerged at every future freshet, the best way to manage it is to let it grow up to willows and cottonwoods. The trees will collect the silt at each rise in the river, and will assist in building the soil up to its former level. Where the land is not so low as to be liable to inundation oftener than once in four or five years, such rich silted flats may be profitably planted with hardy catalpa.

CAVING RIVER BANKS.

At many places along the stream the flood has left perpendicular banks of soft soil that are being constantly undermined by the current, causing the land to cave into the river from time to time. It is very important that such places be protected, for every such caving bank is a menace to all the land lying back of it in the valley.

In such a valley, where the bed of the stream does not come within scores of feet of bed rock, the use of stone structures for protecting the river banks is very expensive, and at the same time ineffective. The most successful method of protecting a soft alluvial river bank is to make it sloping instead of perpendicular, and to keep it covered with vegetation.

The willow is admirably adapted to holding alluvial soil in place. It is far more serviceable for this purpose than walls of masonry, and the facility with which it reproduces itself by seed, suckers, sprouts, and cuttings, both natural and artificial, makes its use very simple and inexpensive.

The great difficulty with planting any sort of tree on perpendicular banks is that the caving of the soil is so rapid that the planted tree has no opportunity to get a start before it is undermined and precipitated into the river. An excellent scheme has been proposed by Mr. E. Bayles, of Linwood, Kan. The plan is as follows: Green willow poles 18 to 20 feet long are secured in the spring, just after the ice goes out of the stream. These poles are laid on the ground near the bank 2 feet apart, with their butts all pointing toward the river. Woven fence wire is then stretched along over the poles and stapled fast to each one. Sections of wire about 100 feet long can be handled to best advantage. After the wire has been securely fastened to the poles, they are all pushed over the bank together, so that the butts of the poles will fall and sink into the soft mud at the water's edge. As the bank caves off some of the falling soil will lodge on the wire, partially burying and weighting down the poles, which will consequently strike root and grow. The wire will serve to hold the mass of willows together until

they have become firmly rooted. The ends of the woven wire should be made fast to wire cables running back over the bank some distance, and fastened to posts set firmly in the ground. The caving and erosion of the bank will soon round off its top corners, and the growing willows at the water's edge will catch the soil as it rolls down the declivity, causing a bank to form of just the right slope to resist erosion most effectually. The following diagram illustrates the method of fastening the poles to the wire.

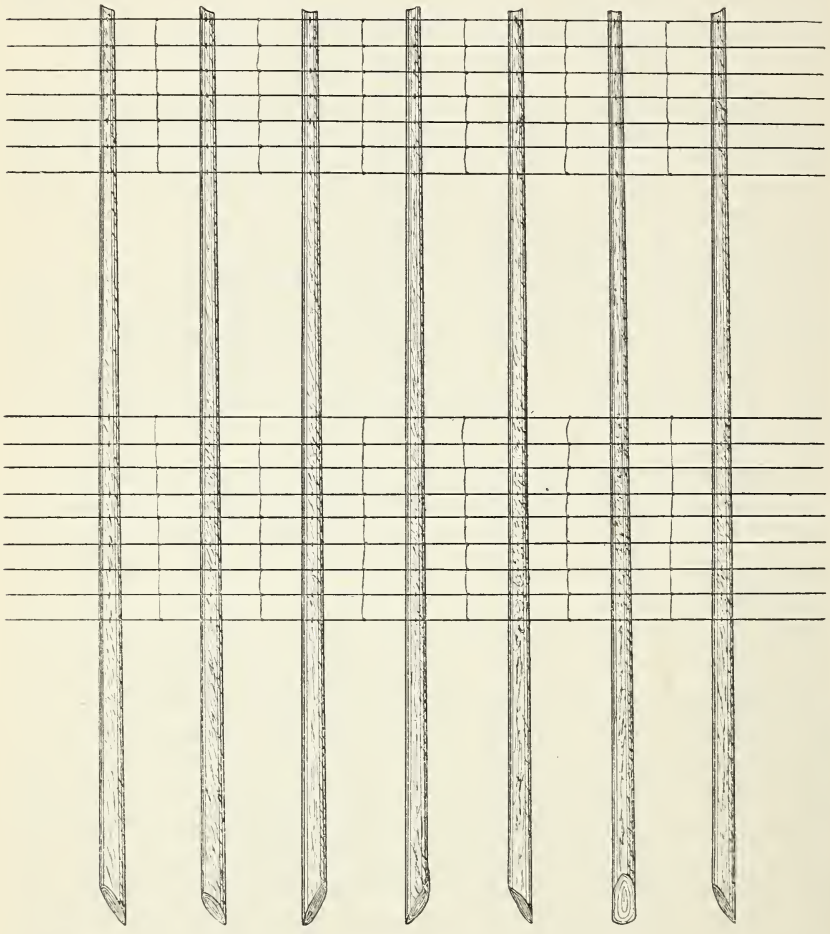

FIG. 1.—Revetment for protecting river bank.

IMPORTANCE OF BEGINNING NOW.

It is urgently recommended that landholders begin operations at once for the reclamation of their injured lands. If these lands are planted to forest trees, in twenty years' time the soil will have been

restored to its former state of fertility. During this time the growing trees will be accumulating a valuable product, for which there is every prospect of a good market. Prof. Chas. E. Bessey, of the University of Nebraska, maintains that even for fuel the growth of cottonwood timber is a very remunerative business, since the cottonwood is capable of producing more heat units per acre per annum than any other tree adapted to the Middle West. The cottonwood makes good lumber for dimension stuff, and will attain a size large enough for sawlogs in twenty years.

The hardy catalpa on rich soil will produce more fence posts per acre in a shorter time than any other species. Some catalpa plantations in Kansas have paid 6 per cent compound interest on the land and labor invested, and $10 an acre per annum net profit, for a period of twenty years. This is a much greater income than the average returns from agriculture.

With such prospects in view the owner of Kansas River Valley lands need not feel discouraged, even though his valuable farm lands have been rendered temporarily worthless for agriculture.

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Approved:
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